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(54) **Strong nonwoven fabrics from engineered multiconstituent fibers**

Starke nicht-gewebte Stoffe aus entwickelten Fasern mit mehreren Bestandteilen

Etoffes résistantes non tissées faites avec des fibres développées à constituants multiples

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DescriptionBackground of The Invention

1. Field of the Invention

This invention relates to nonwoven fabrics made by thermally bonding fibrous webs made from certain types of multiconstituent fibers, and to laminates incorporating said fabrics. Thermal bonding of the nonwoven fabrics may be accomplished by calender or "through air" techniques or ultrasonically. The multiconstituent fibrous webs may contain other fibers in addition to the thermoplastic multiconstituent fibers. The nonwoven fabrics produced according to the present invention may be optimized as to softness and strength characteristics.

2. Description of the Prior Art

Structured multicomponent fibers -- made by coextrusion of different polymers in a variety of structured configurations -- have long been well-known. Some relevant references are: Davies US-A-3 595 731, Gerlach US-A-4 361 609, Kiriya US-A-4 568 506, and Uchikawa US-A-4 770 925.

A few references cite fibers and nonwoven fabrics made from polymer blends wherein the dominant continuous phase is lower melting than is the dispersed discontinuous phase; see Kubo EP-A-0 277 707, Winckhofer US-A-3 620 892 and Vassilatos US-A-4 632 861. By definition, to thermally bond such fibers, portions of the continuous fiberphase are raised to temperatures where partial molecular relaxation of the continuous lower melting phase occurs. Relaxation occurs not only at the bond site proper but also in the fiber region surrounding the bond site which is responsible for distributing a load or strain throughout the bonded fiber network. Although thermally-bonded nonwoven fabrics can be made from these materials, strength is compromised.

Some instances are also known wherein blends of different polymers are extruded from the orifices of spinnerets in order to make fibers containing "free form" microfibrils which can then be separated from the matrix polymer: Breen US-A-3 382 305, and Twilley US-A-3 369 057.

Graham US-A-4 769 279 refers to meltblown fibers and fabrics made from blends of ethylene/acrylic copolymer with a second fiber-forming polymer such as a polyvinyl, a polyamide, and a polyolefin. Graham does not disclose thermally-bonded nonwoven fabrics from engineered fibers, however. Furthermore, the Graham disclosure is limited to blends based upon low viscosity ethylene/acrylic copolymers.

Finally, Sugihara et al. US-A-4 477 516 discloses a nonwoven fabric containing composite fibers in which one component contains 50-100% linear low density polyethylene and 50-0% of another kind of polyethylene and the other component is a polymer having a melting point 30°C or more higher than that of the polyethylenes. The first polymer component constitutes at least part of the fiber surface and extends continuously in the longitudinal direction. The composite shape of the first component may be either a side-by-side or sheath and core type configuration.

Summary of The Invention

The present invention provides nonwoven fabrics made of engineered multiconstituent fibers. By "engineered" fibers, we mean oriented fibers made by melt-spinning blends of two or more immiscible polymers that are highly dispersed and that contain a dominant continuous phase which is substantially higher in melting point than the discontinuous phase or phases.

One embodiment of the present invention provides a thermally-bonded nonwoven fabric having a basis weight in the range of 5 through 100 g/m² that is made from a web which comprises from 100 to 5 percent by weight of a multiconstituent fiber having a fineness of 5 to 50 μm and up to 95 percent by weight of other fibers. Said multiconstituent fiber is composed of a highly dispersed blend of at least two different immiscible thermoplastic polymers and has a dominant continuous polymer phase and at least one discontinuous phase dispersed therein. The discontinuous phase exists as an elongated fibrillar polymer domain oriented generally in the direction of the fiber axis. The mean of the polymer domain cross-sections of said discontinuous phase or phases is less than 0.1% of the cross-sectional area of said fiber. The polymer of the discontinuous phase or phases has a Polymer Melt Temperature (PMT) at least 30°C below the PMT of said continuous phase. The fiber is configured such that said discontinuous phase or phases occupy a substantial portion of the fiber surface.

In addition to the fabrics described above laminates --made by combining nonwoven fabrics made from the materials and processes as described herein with films, paper, tissue, woven fabrics, or nonwoven fabrics such as meltblowns -- are also contemplated. The fabric according to the invention readily bonds to other materials of the sorts mentioned, and is therefore suitable for use in filtration media, medical and clean room garments, CSR wrap, absorbent article backsheet, and other barrier structures.

Brief Description of The Drawings

Figure 1 is a photomicrograph of a cross-section of a 20-micron-diameter fiber enlarged 25,000 times.

Figure 2 is a graphic comparison of tensile strengths versus temperature for various fibers.

Description of The Preferred Embodiments

Biconstituent or multiconstituent fibers that may be used to make fabrics according to the present invention are those which are spun from an intimately-mixed blend of different polymers in which at least two of the polymers in the blend are immiscible. The choice of polymers is limited to those that are thermoplastic (including many elastomers) and that have a melt temperature below 350°C, preferably below 275°C. Examples of polymers that can be used are:

Polyethenes:

Low density PE (.90 - .940 g/cc)

Long-chain branched PE

LLDPE (made with C₃-C₁₀ alpha-1-olefin copolymers or 4-methyl-1-pentene)

Medium and high density PE (.940 - .960 g/cc)

Homopolymer or with copolymers described above

Atactic polypropylene

Polypropylene (at least 90% isotactic)

Block copolymers of ethylene and propylene

Random copolymers of ethylene and propylene

Polybutylene

Poly(4-methyl-1-pentene) [TPX]

Polycarbonate

Polyesters, e.g. poly(oxyethyleneoxyterephthaloy)

Polyamides, e.g. poly(imino-1-oxohexamethylene) [Nylon 6]

and poly(imino-hexamethyleneiminoadipoyl) [Nylon 66]

Poly(oxymethylene)

Polystyrene

Styrene copolymers, e.g. styrene acrylonitrile [SAN]

Polyphenylene ether

Polyphenylene Oxide [PPO]

Polyetheretherketone [PEEK]

Polyetherimide

Polyphenylene Sulfide [PPS]

Poly(vinyl acetate) [PVA]

Poly(methyl methacrylate) [PMMA]

Poly(methacrylate) [PMA]

Ethylene acrylic acid copolymer

Polysulfone

The biconstituent or multiconstituent fibers that make up a significant portion of the webs to be thermally bonded according to the present invention must exhibit a high degree of dispersion. In principle, the mean of the cross-sectional areas of the noncontinuous phase or phases is less than 1/1000th of the cross-sectional area of the fiber. Factors which determine the level of dispersion and phase morphology of the dispersed phase or phases in blend fibers are discussed in detail by D.R. Paul in "Polymer Blends", volume 2, chapter 16. Briefly, the dispersed-phase morphology of the blend fiber is dependent upon the relative rheologies of the blend components, the interfacial tension between the two or more phases, the polymer volume ratio, and the three stages of the blend melt preparation and processing: melt dispersion, extrusion, and extrudate draw-down prior to solidification. In general, the largest domains in the blend will exist when the polymer ratio is near 1.0; at this point the polymers are nearly cocontinuous. The domain size of the discontinuous phase will decrease as the ratio deviates from 1.0, given that the quantity of work "mixed" into the blend and the melt spinning conditions remain constant.

Thermal bonding work on fabrics made from biconstituent polyethylene/polypropylene staple fibers has demonstrated weak bonding at calender temperatures at and just above the melting point of the lower melting polyethylene constituent. One of the problems with biconstituents in general in thermal bonding can be that the lower melting component is distributed throughout the fiber matrix rather than being concentrated at the surface where it can be active in bonding. Therefore fibers according to the present invention are often preferably fibers with increased surface-to-volume ratios,

with the ultimate being a ribbon-shaped fiber. High surface/volume fibers make more of the lower melting component available for bonding, which ultimately results in higher tensile strength fabrics and laminates.

Figure 1, is a TEM photomicrograph of a RuO₄-stained polyethylene/polypropylene fiber cross-section, enlarged 25,000 times. The dark domains are polyethylene (PE); the lighter domains are the continuous polypropylene (PP) phase. The photograph demonstrates how well the PE phase is dispersed in the PP phase. It is interesting to note how the PE phases become circumferentially elongated at the fiber surface.

Fibers used to make fabric in accordance with the present invention may be processed as follows: two or more polymers, selected to meet the melting point differential that characterizes the present invention, are combined and blended to form a dispersion. The dispersion is then either melt-spun into fibers, which may be formed into webs for instance by carding, airlaying, or wetlaying, or melt-spun directly into fibrous webs by a spunbonding process. The webs are then thermally-bonded to transform them into strong soft biconstituent-fiber nonwoven fabrics. The specific fabric characteristics will be dependent on the choice of precursor fiber and processing conditions. Said nonwoven fabrics may then be laminated into structures having a variety of desirable end-use characteristics.

Appropriate combinations of polymers combined to make the fibers used in accordance with the present invention are intimately blended before being melt-spun into fibers or fibrous webs. A high degree of mixing is necessary in order to prepare blends that will satisfy the degree of dispersion criteria that characterizes the fibers used according to the present invention. Among the commercially available mixers that can be used are the Barmag 3DD three-dimensional dynamic mixer supplied by Barmag AG of West Germany and the RAPRA CTM cavity-transfer mixer supplied by the Rubber and Plastics Research Association of Great Britain.

An example of an immiscible blend according to the present invention is a supermixed blend of linear low density polyethylene with polypropylene.

Thermally-bonded nonwoven fabrics according to the present invention exhibit advantages over similar homofilament-based nonwovens. A few of those advantages are higher tensile strength/basis weight ratio, and higher tear resistance/basis weight ratio. Many of these advantages are made possible by the fact that the lower melting component of the fibers used according to the present invention effects bonding at conditions that do not cause "relaxation" or loss of molecular orientation of the higher melting component. Typically, fiber used for thermally-bonded coverstock is not highly oriented. Highly oriented polypropylene, for example, is difficult to bond thermally without loss of molecular orientation in the individual filament. In addition, fabrics made from highly drawn polypropylene are harsh and possess poor "hand". The filaments described by the present invention can be highly drawn to impart high tenacities and then thermally bonded into a nonwoven fabric with essentially no loss of individual filament tenacity. The retention of individual filament tenacity improves the strength properties of the fabric. Selection of the appropriate polymer (polyethylene for example) as the bonding constituent yields a fabric with greater softness than its homofilament counterpart.

The process for manufacturing the webs to be thermally or sonically bonded according to the present invention can be any of the known commercial processes for making nonwoven fabrics, including processes that use mechanical, electrical, pneumatic, or hydrodynamic means for assembling fibers into a web, for example carding, wetlaying, carding/hydroentangling, wetlaying/hydroentangling, and spunbonding.

Example 1

Biconstituent staple fiber was prepared by dry blending 40% by weight of an ethylene/1-octene linear low density polyethylene [LLDPE] having a melt index of 26.5 and a density of 0.940 grams/cc with 60% by weight of controlled rheology polypropylene [PP] having a melt flow rate of 26. The dry blend [PP/LLDPE] was fed into a single-screw extrusion system equipped with a Barmag 3DD intensive mixer. Filaments were extruded and drawn to a final dTex (denier) per filament of approximately 2.2 (2.0). Line speeds and cold draw ratios were adjusted to produce two filament samples, one having 2X cold draw and another having 3.5X draw. Refer to Table I, samples 8319-2 and 8319-3, respectively.

One gram samples of each fiber type were formed into a web using a lab-scale carding device. The carded webs were then bonded on a Beloit-Wheeler lab top calender using a 16%-diamond-bonded pattern and a nip pressure of approximately 71.4 kg/cm (400 PLI). Strip tensile strengths were determined for samples bonded over a range of temperatures. Carded webs made from Hercules T-185 polypropylene fiber served as a control. The biconstituent-based fabrics demonstrate superior tensile properties over the polypropylene homofilament-based fabric (see Tables II, III, and IV, and Figure 2).

Example 2

Both polypropylene and PP/LLDPE dry blend samples were (separately) fed into a single-screw extrusion system equipped with a Barmag 3DD intensive mixer. Filaments were extruded and drawn to a final dTex (denier) per filament of approximately 2.2 (2.0). Line speeds and cold draw ratios were adjusted to produce filament samples having 2X draw. Refer to Table I, samples 8319-1A and 8319-2, respectively.

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Each fiber sample was separately carded and thermally bonded on a 36-inch-wide semicommercial line. Physical properties were then determined for the fabric samples. Data in Table V. The biconstituent fiber-based fabrics exhibited superior strip and grab tensiles, energies at yield (TEA), and tear values.

Example 3

Staple biconstituent fiber containing 1% by weight of a substituted-sorbitol nucleating agent was prepared from dry blends of PP/LLDPE that was fed into a single-screw extrusion system equipped with a Barmag 3DD intensive mixer. Filaments were extruded and drawn to a final dTex (denier) per filament of approximately 2.2 (2.0). Line speeds and cold draw ratios were adjusted to produce filament samples having 3.5X draw. Refer to Table I, sample 8319-7.

The fiber was carded and thermally bonded on a 91.4-cm - (36-inch-) wide semicommercial line. Data in Table VI. The strip and grab tensiles, energies at yield, and tear values were superior to a similar fiber sample without nucleating agent.

Example 4

Biconstituent fiber 8342 was prepared from a dry blend of 40% by weight of an ethylene/1-octene copolymer [LLDPE] having a melt index of 50 and a density of 0.925 g/cc with 60% by weight of controlled rheology polypropylene [PP] having a melt flow of 35. Multiconstituent fiber 8343 was prepared from a dry blend of 40% by weight LLDPE having a melt index of 50 and a density of 0.925 g/cc with 55% by weight of controlled rheology PP having a melt flow of 35 and with 5% by weight of ethylene/acrylic acid copolymer [EAA] composed of low density polyethylene having a melt index of 300 and an acrylic acid content of 20%. Melt blends were then separately prepared and extruded and pelletized using a single screw extruder equipped with a 6 row Rapra cavity-transfer mixer (CTM) and a strand die cutter. The polymer-blend pellets were then separately re-extruded into filaments and melt-drawn to a final dTex (denier) per filament of 2.1 (1.9) and 3.0 (2.7), respectively.

One gram samples of each fiber type were formed into webs, bonded, and tested as described in Example 1. Filament and fabric tensile properties are indicated in Table VII.

END-USE EXAMPLES

Example 5

8350-1A: PE film to PE/PP bicon fabric 8326-03 33.9 g/m² ((1 osy))

8350-1B: PE film to PP fabric 8326-02 33.9 g/m² ((1 osy))

To demonstrate the ability of multiconstituent fabric to form a fabric/film laminate, five-inch-wide fabric samples of a thermally bonded multiconstituent fiber-based nonwoven fabrics were "heat sealed" to polyethylene film. Laminate samples were prepared by heat-sealing a sandwich structure composed of carded fabric (8326-02 and 8326-03) (bottom) /polyethylene film (middle)/cover fabric (8326-02) (top). The cover fabric was used to insulate the low melting film from the sealing die. Fabric and film dimensions were 12.7 cm (5") X 30.5 cm (12"). Time, pressure, and die-temperature conditions were chosen that insured optimum adhesion of the fabric to the film while maintaining the film integrity. The heat sealer used was a Hut-Theller Precision Instruments West, Model EB (Petaluma, California). Multiple heat-sealed samples were prepared by sealing across the width of the laminate sample. The die dimensions were flat, 0.95 cm (3/8") X 12.7 cm (5"), or 12.1 cm² (1.875 square inches.)

Peel strengths were determined relative to a homofil fabric laminate control. Peel strengths are indicative of the level of adhesion between the fabric and film layers of the laminate. Peel strengths were determined using an Instron Model 4201 tensile tester. Strips 1-inch wide were cut from each sealed sample. The fabric was placed in the upper grip of the tensile tester and the film in the lower grip. A gauge length of 7.6 cm (3-inches) and a cross-head speed of 12.7 cm (5-inches)/minute were used. Peel strength properties are indicated in Table VIII. The level of adhesion was greater for the laminate which contained the multiconstituent fiber.

Examples 6 and 7 relate to breathable liquid barrier laminates with textile-like hand. Such laminates are suitable for use but not limited to use as medical and industrial garments, CSR wrap, surgical drape, and housewrap. The laminates are prepared from a layer or layers of microfibrillar (for example meltblown) polymer, such as polypropylene, sandwiched between two layers of nonwoven fabric containing multiconstituent fiber according to the present invention. The discontinuous polymer phase of the multiconstituent fiber occupies a portion of the surface of the fiber such that both polymers of the blend are available for thermal or sonic bonding and/or lamination. The fabric can be bonded prior to lamination or can be directly deposited on either side of the microfibrillar layer just prior to lamination.

The microfibrillar layer can be composed of meltblown fibers, wet laid pulps, or webs prepared by other known

means. The microfibrinous layer can be formed prior to the lamination or extruded or formed directly onto the multiconstituent nonwoven fabric prior to lamination. The microfibrinous layer must be composed of a polymer which adheres to either the continuous or discontinuous polymer component of the multiconstituent fiber upon thermal or sonic lamination.

Thus for instance, high melt flow isotactic polypropylene could be meltblown into a microfibrinous web and then laminated to a fabric made from a polymer-blend fiber having a polypropylene as one of the polymer constituents. Lamination can be with known calendering or sonic bonding technology. Bond pattern and processing conditions can be tailored to impart the desired combination of strength, barrier, drape, and textile aesthetics.

Example 6

Samples of flat-calendered "sandwich-type" laminates were prepared from a polypropylene meltblown web weighing 20 grams per square meter and having a nominal filament diameter of 5 microns and two outer nonwoven layers composed of a multiconstituent fiber-based nonwoven fabric like that described in Example 1 and identified as Sample No. 8326-03 in Table V. The three webs were simultaneously unwound from a backstand and fed continuously into a heated calender nip. The lamination was effected using a 55.9 cm (22") lab calender equipped with a heated smooth rubber roll and a heated smooth steel roll. The samples were prepared at varied calender roll surface temperatures, ranging from 159°C (318°F) to 152°C (306°F) for the steel roll and from 149°C (300°F) to 140°C (284°F), for the rubber roll. Nip pressure was held constant at 26.8 kg/cm (150 pounds per linear inch (pli)), and line speed was held constant at 6.71 m/min (22 feet per minute).

Physical properties were determined for the resulting laminate samples and are identified as sample numbers 8331-1A through 8331-1F in Table IX. It is apparent from these data (8331-1A through 8331-1F) that a breathable liquid-barrier laminate can be obtained with excellent fabric tenacity.

Example 7

A helically-bonded "sandwich-type" laminate was prepared by a procedure similar to that described in Example 6, but wherein the smooth rolls were replaced with steel rolls engraved with a diagonal line pattern such that the angle between the crisscross bond lines of the diagonal bonds opening in the machine direction (MD) measures 120 degrees, each line measuring 60 degrees off the MD axis and such that the raised bonding surfaces of each roll are flat and approximately 1 mm wide, separated by a recessed area measuring approximately 1.5 mm wide. A laminate fabric was produced at 6.7 m/min (22 fpm), 26.8 kg/cm (150 pli), at a calender roll surface temperature of 143°C (290°F) to 146°C (294°F).

Physical properties were determined for the fabric which is identified as sample number 8331-04 in Table IX. It is apparent from a comparison of the thickness, tensile, and barrier properties of this fabric with those in the same Table which have been flat-calendered that significantly different properties can be obtained for laminates composed of identical starting materials. Thickness is greatly increased over the flat-calendered samples. The loft of a fibrous web contributes to its ability to filter airborne or liquidborne particles efficiently. Air permeability is equivalent to breathability, a property associated with comfort in disposable garments. Air permeability combined with liquid barrier properties defines a fabric which can be used as a protective garment in a medical or industrial end use. In addition, the range of properties exhibited by these laminates demonstrate the flexibility of multiconstituent fabrics in laminate applications.

Example 8

By use of the isotactic polypropylene/linear low density polyethylene polymer blend fiber-based fabric described in Table V (Sample No. 8326-04C), laminates were prepared that demonstrate the flexible bonding character of these novel substrates. Film and meltblown fabric were acquired whose polymer compositions matched either that of the continuous phase or that of the noncontinuous phase of the polymer-blend fiber. The grades of each polymer were selected that suited the respective substrate manufacturing processes, and are therefore not the identical polymers used in the manufacture of the multiconstituent fiber. "Sandwich-type" laminates were prepared using the procedure described in Example 7.

Physical property data appears in Table X. It is apparent from examination of this data that laminates exhibiting excellent tensile and barrier properties can be prepared by bonding the multiconstituent fiber-based fabric to substrates composed of a polymer selected from the same polymer groups represented in the multiconstituent fiber.

From the above-description and specific Examples of the invention, many variation in the webs, composites, useful products, and processes of this invention will be apparent to those skilled in the relevant arts.

TABLE I
BICONSTITUENT FILAMENT
PROPERTIES

DB #	POLYBLEND FIBER DESCRIPTION	COLD DRAW RATIO	DTEX PER FILAMENT	DENIER PER FILAMENT	FILAMENT TENACITY (g/dtex)	FILAMENT TENACITY [(g/den)]	ELONGATION AT BREAK (%)
8319-1A	PP	2.2	2.33	[2.10] (.10)	3.47	[3.12] (.12)	51 (9.4)
8319-1B	PP	3.5	2.17	[1.95] (.10)	5.24	[4.72] (.39)	27 (3.7)
8319-2	40/60 PE(a)/PP	2	2.18	[1.96] (.11)	2.27	[2.04] (.09)	95 (40)
8319-3	40/60 PE(a)/PP	3.5	2.20	[1.98] (.11)	3.66	[3.29] (.39)	33 (7)
8319-4	40/60 PE(b)/PP	2	2.22	[2.00] (.10)	2.66	[2.39] (.11)	128 (32)
8319-5	40/60 PE(b)/PP	3.5	2.21	[1.99] (.12)	4.42	[3.98] (.20)	39 (4.8)
8319-6	PE(a)/PP + .5% NA	2	2.18	[1.96] (.12)	2.06	[1.85] (.08)	59 (18.6)
8319-7	PE(a)/PP + .5% NA	3.5	2.16	[1.94] (.10)	4.17	[3.75] (.17)	35 (5.3)

(#) - DENOTES STANDARD DEVIATION, WHERE n=10.
 PE(a) - DOW ASPUN (R) 6811, octene-1/ethylene copolymer, MI=26
 PE(b) - DOW ASPUN (R) 6815, octene-1/ethylene copolymer, MI=12
 PP - HIMONT Z30S Controlled Rheology Grade Polypropylene, MF=26
 NA - MILAD 5L71-10 Nucleating Agent. 10% conc. in LLDPE

LAB TOP FABRIC PROPERTIES
OF BICONSTITUENT BASED THERMAL BOND FABRICS

TABLE II
(FIBER: 40/60 PE/PP, 8319-2, 2X DRAW, TABLE I)

DB #	CALENDER SURFACE TEMPERATURE		STRIP TENSILE		SD	TE	TEA [in-g/in ²]	cm-g/cm ²
	Embossed °C	Embossed [°F]	Smooth °C	Smooth [°F]				
8324-1	115	[240]	117	[244]	87	11	[116]	45.7
2	121	[250]	123	[254]	55	17	[224]	88.2
3	123	[255]	126	[259]	86	15	[317]	124.8
4	126	[260]	128	[264]	48	19	[302]	118.9
5	129	[265]	131	[269]	185	20	[347]	136.6
6	132	[270]	134	[274]	184	22	[451]	177.6
7	135	[275]	137	[279]	100	23	[484]	190.6
8	137	[280]	139	[284]	141	21	[554]	218.1
9	142	[289]	140	[285]	177	28	[821]	323.2
10	145	[294]	143	[290]	215	27	[804]	316.5
11	148	[299]	146	[295]	355	32	[930]	366.1
12	151	[305]	149	[300]	272	27	[686]	270.1

NOTES: ALL SAMPLES PRODUCED AT 89.3 kg/cm (500 PLI), 6.7 m/min (22 FPM), 18% BOND AREA

TABLE III
(FIBER: 40/60 PE/PP, 8319-3, 3.5X DRAW, TABLE I)

DB #	CALENDER SURFACE TEMPERATURE		STRIP TENSILE		SD	%E	TEA	
	Embossed °C	Embossed [°F]	Smooth °C	Smooth [°F]			[in-g/in ²]	cm-g/cm ²
8324-13	115	[240]	118	[245]	469	53	[49]	19.3
14	118	[245]	120	[249]	625	42	[78]	30.7
15	121	[250]	123	[254]	765	52	[100]	39.4
16	123	[255]	126	[259]	977	58	[123]	48.4
17	126	[260]	128	[264]	1115	216	[153]	60.2
18	129	[265]	131	[269]	1067	185	[128]	50.4
19	132	[270]	134	[274]	1351	186	[164]	64.6
20	135	[275]	137	[279]	1368	93	[158]	62.2
21	137	[280]	139	[284]	1568	147	[182]	71.7
22	142	[289]	140	[285]	1868	121	[247]	97.2
23	145	[294]	143	[290]	3230	173	[381]	150.0
24	148	[299]	146	[295]	4228	181	[559]	220.1
25	151	[305]	149	[300]	2704	211	[644]	253.5

TABLE IV
(FIBER: HERCULES T-185)

DB #	CALENDER SURFACE TEMPERATURE		STRIP TENSILE		SD	%E	TEA	
	Embossed °C	Embossed [°F]	Smooth °C	Smooth [°F]			[in-g/in ²]	cm-g/cm ²
8324-26	132	[270]	129	[265]	834	29	[196]	77.2
27	137	[280]	135	[275]	1611	103	[573]	225.6
28	143	[290]	140	[285]	2705	51	[1757]	691.7
29	149	[300]	146	[295]	2809	361	[1289]	507.5
30	154	[310]	151	[305]	2136	95	[232]	91.3

NOTES: ALL SAMPLES PRODUCED AT 89.3 Kg/cm [500 PLI], 6.7 meters per minute [22 FPM], 18% BOND AREA

TABLE V
PHYSICAL PROPERTIES
OF SELECTED STAPLE
BICONSTITUENTS

DB #	FIBER SAMPLE IDENTIFICATION (TABLE I)	dtex (denier)	FIBER (denier)	°C	CALENDER SURFACE [°F]	g/m ²	Basic Weight [g/y]	LOFT [mil]	MDN (LOSV) (g/2.54cm)	-----STRIP TENSILES-----					
										TEA [ln-g/in ² cm-g/cm ²]	CDR (LOSV) (g/2.54cm)	TEA [ln-g/in ² cm-g/cm ²]	TEA [ln-g/in ² cm-g/cm ²]		
8326-02	PP FIBER 8319-1	2.22	[2]	132/149	[370/300]	24.1	[28.8]	0.40	[15.9]	1124	35	[164]	64.6	288	39
8326-03	FIBER 8319-2. 2X	2.17	[1.95]	132/146	[370/335]	27.3	[32.6]	0.34	[13.4]	2098	24	[415]	163.4	501	59
8326-040	SAME AS ABOVE	2.17	[1.95]	149/149	[300/300]	26.4	[31.6]	0.34	[13.3]	1972	14	[207]	81.5	704	40

TABLE V CON'T.

ELEMENTORY

--GRAB TENSILES--

TEAR

DATABASE#	FIBER SAMPLE IDENTIFICATION (TABLE I)	kg		lb		kg		lb		kg		lb		kg		lb	
		MD	[LBS]	TE	[LBS]	MD	[LBS]	TE	[LBS]	CD	[LBS]	MD	[LBS]	TE	[LBS]	CD	[LBS]
8326-02	PP FIBER 8319-1	2.18	[4.8]	16	[4.8]	0.95	[2.1]	33	[7.5]	109	[24.5]	144	[32.5]	1.7	[3.8]	149	[33.0]
8326-03	FIBER 8319-2. 2X	4.76	[10.5]	24	[5.3]	2.09	[4.6]	58	[12.9]	138	[30.9]	200	[45.0]	0.9	[2.0]	200	[45.0]
8326-040	SAME AS ABOVE	4.17	[9.2]	15	[3.3]	2.77	[6.1]	46	[10.3]	72	[16.0]	149	[33.0]	-0.8	[-1.8]	149	[33.0]

TABLE VI
PHYSICAL PROPERTIES
OF SELECTED STAPLE
BICONSTITUENTS

---STRIP TENSILES---

DATABOOK#	FIBER SAMPLE IDENTIFICATION (TABLE I)	dtex	DENIER (dpf)	°C	CALENDAR SURFACE [°F]	g/m ² [gsy]	B.W. [mm]	MD# LOFT [mils]	(g/2.54cm) (LOS)	TE (in-g/in ³)	TEA (in-g/in ³)	cm-g/cm ²
8326-05	FIBER 8319-3	2.20	[1.98]	132/143	[270/290]	25.5	[30.5]	0.33	[12.9]	1293	29	[173] 68.1
8326-07	FIBER 8319-6	2.14	[1.93]	132/94	[270/200]	25.9	[31]	0.36	[14.1]	1293	29	[262] 103.1

TABLE VI CON'T.

---STRIP TENSILES---

DATABOOK#	FIBER SAMPLE CD# IDENTIFICATION (TABLE I)	LOS (g/2.54cm)	TE (in-g/in ³)	cm-g/cm ²	TEA (in-g/in ³)	kg [lbs]	MD [lbs]	TE [kg]	CD [lbs]	MD (g)	CD (g)	SOFT.
8326-05	FIBER 8319-3	343	43	36.6	[93]	2.77	[6.1]	15	1.22	[2.7]	32	122 178 0.4
8326-07	FIBER 8319-6	464	43	51.6	[131]	3.72	[8.2]	18	1.81	[4]	40	178 229 0.7

---GRAB TENSILES---

ELMENDORF
TEAR

TABLE VII
FILAMENT AND FABRIC PROPERTIES
OF SELECTED MULTICONSTITUENT FIBERS

Fabric Sample No. (1)	FILAMENT PROPERTIES (1)					FABRIC PROPERTIES (2)			
	dtex [dpf]	g/dtex	Tenacity [gpd]	Elong. (%)	Toughness [gpd]	Tensile (g/2.54cm)	Elong. (%)	TEA [in-g/in ²]	cm-g/cm ²
8342-1	2.1 [1.9]	1.69	[1.52]	420	5.00	2808	74	[993]	390.9
STD DEV.			(0.16)	(61)	(1.0)	(251)	(17)		
8343-1	3.0 [2.7]	1.11	[1.0]	405	3.00	3276	30	[727]	286.2
STD DEV.			(0.21)	(124)	(0.8)	(377)	(6)		

STD DEV: N-10

(1) 8342-1 Fabric: melt blend fiber composed of 40:60 wt % PE:PP
8343-1 Fabric: melt blend fiber composed of 40:55:5 wt. % PE:PP:EAA

(2) Fabric properties normalized to 33.9 g/m² (1.0 ounce/yd²) basis weight

TABLE IX
PE/PP BICONSTITUENT LAMINATES
PHYSICAL PROPERTIES

--STRIP TENSILES (2) --

DB#	SAMPLE DESCRIPTION (1)	B.W. [gsv]	MODEL 549 THICK [mils]	mm	°C	TEMP. [°F]	MD [g/2.54 cm]	TEA [in-g/in ²]	cm-g/cm ²	CD [g/2.54 cm]	TEA [in-g/in ²]	TEA cm-g/cm ²
8331-1A	PC BIVON./PPMB/BICON	88.6 [106]	0.29 [11.7]		159/149	[318/300]	9078	15	1306	514.2	3940	98.4
8331-1B		85.3 [102]	0.23 [9.2]		157/147	[316/297]	9340	15	1078	424.4	4286	104.7
8331-1C		75.2 [90]	0.22 [8.5]		156/145	[313/294]	9508	16	1984	387.4	3871	83.1
8331-1D		77.8 [93]	0.22 [8.6]		154/143	[310/290]	7963	11	1674	265.4	4002	76.4
8331-1E		74.4 [89]	0.21 [8.3]		153/141	[308/287]	9189	14	1851	336.6	4320	86.2
8331-1F		80.3 [96]	0.23 [9.2]		152/140	[305/284]	8440	14	11016	400.0	3796	102.5
8331-04	HELIC.BIC./PPMB/BIC.	71.9 [86]	0.60 [23.6]		143/145	[290/294]	5863	15	1625	246.1	3211	138.5

TABLE IX CON'T.

DB#	SAMPLE DESCRIPTION (1)	ELMENDORF TEAR MD (g/2.54cm)	CD (g/2.54cm)	GURLEY POROSITY (sec)	HYDRO- STATIC HEAD (cm)	MASON JAR (sec)
8331-1A	FC BIVON./PPMB/BICON	360	770	56	275	10
8331-1B		325	575	93	>5min	70
8331-1C		290	490	120	>5min	39
8331-1D		260	580	66	>5min	26
8331-1E		310	520	65	>5min	33
8331-1F		320	600	29	>5min	28
8331-04	HELIC.BIC./PPMB/BIC.	330	460	inst.	7	3

NOTES: (1) FC-FLAT CALENDERED

HELIC. - CRISSCROSS BOND PATTERN FROM HELICAL ROLLS

PPMB - POLYPROPYLENE MELT BLOWN (20 gse)

BICON - POLYETHYLENE/POLYPROPYLENE BICONSTITUENT FIBER BASED FABRIC-8326-03

(2) TENSILES CORRECTED TO 111.6g/m² (3 OSY UNIT WEIGHT)

TABLE X
PHYSICAL PROPERTIES OF
POLYETHYLENE/POLYPROPYLENE
BICONSTITUENT FABRIC LAMINATES

SAMPLE No.	DESCRIPTION (1)	CALENDER		UNIT		(3)		GRAB TENSILES			
		TEMP. (2) °C	TEMP. (2) °F	g/m ²	WT. [g/y]	mm	CALIPER [mils]	kg	MD [lbs]	EL. [k]	CD [lbs]
8333-05	BICON/PE FILM/BICON	122/128	[252/263]	64.0	[76.6]	0.71	[28.1]	9.9	[22]	27	5.3 [11.7]
8333-06	BICON/PP FILM/BICON	141/142	[287/288]	59.3	[70.9]	0.67	[26.4]	10.3	[22.7]	30	5.0 [11.1]
8333-04	BICON/PE-MB/BICON	131/126	[268/260]	78.3	[93.6]	0.68	[26.8]	10.5	[23.1]	24	4.6 [10.2]
8331-04	BICON/PP-MB/BICON	143/145	[290/294]	72.2	[86.3]	0.69	[27.2]	11.5	[25.3]	25	4.9 [10.8]

TABLE X CON'T.

SAMPLE	DESCRIPTION (1)	ELM TEAR		KPa	BURST [psi]	(4)		(5)	HYDRO- STATIC HEAD [cm]
		MD (g)	CD (g)			GURLEY [psi]	POKOSITY [567g/(20oz)]		
8333-05	BICON/PE FILM/BICON	400	540	144.8 [21]	NR	NR	53.3	3.16	18.4
8333-06	BICON/PP FILM/BICON	330	430	131.0 [19]	NR	NR	98	163	23.7
8333-04	BICON/PE-MB/BICON	350	400	137.9 [20]	NR	1.57	NR	inst.	16.1
8331-04	BICON/PP-MB/BICON	320	380	131.0 [19]	NR	7.1	NR	3	13.2

NOTES: ALL PE IS 1-OCTENE, LINEAR LOW DENSITY POLYETHYLENE, UNLESS OTHERWISE STATED

(1) BICON-BICONSTITUENT FIBER-BASED FABRIC (8326-04 CARDED THERMALBOND,

40:60, PE:PP), 1 OSY

PE FILM - LOW DENSITY POLYETHYLENE FILM OBTAINED FROM EDISON PLASTIC 25 x 10⁻⁶m, (1 MIL).

PP FILM - POLYPROPYLENE FILM OBTAINED FROM EDISON PLASTIC, 25 x 10⁻⁶m (1 MIL).

PE-MB - POLYETHYLENE MELTBLOWN FABRIC, 20GSM

(2) CALENDER - HELICAL STEEL/HELICAL STEEL, NIP PRESSURE = 62.5 kg/cm (350 PLI), LINE
SPEED=12.5 FPM

(3) FABRIC CALIPER MEASURED USING A 551-M CALIPER TESTER

(4) NR-NO READING, PROCESS EITHER TOO FAST OR TOO SLOW FOR ACCURATE MEASUREMENT

(5) INST - INSTANTANEOUS

The fabric of this invention comprises

(a) from 100 to 5 percent by weight of one or more multiconstituent fibers having preferably a fineness of 0.9 (1) to 9 (10) dTex (denier) and a surface to volume ratio greater than 0.6, and

(b) from 0 to 95 percent by weight of other fibers having preferably a fineness of 9 dTex (10 denier) or lower.

According to a preferred embodiment of the invention the fabric consists essentially of from 50 to 5% by weight of said multiconstituent fibers and from 50 to 95% by weight of other textile fibers.

The fabric may have a basis weight in the range of from about 15 grams per square meter through about 55 grams per square meter. Said multiconstituent fibers may have fineness of 1.0 to 30 microns and a round or flattened cross-sectional profile.

The fabric of this invention may be formed by a procedure selected from the group consisting of carding/thermal bonding, spunbonding, wetlaying/thermal bonding, centrifugal spinning/spunbonding, wetlaying/hydroentangling/thermal bonding, and carding/hydroentangling/thermal bonding.

The multiconstituent fiber may contain a nucleating or clarifying agent selected from the group consisting of substituted sorbitols, acrylic acid modified polypropylenes, organic acids, sodium benzoate, and stearates.

It may further contain an additive or additives selective from the group consisting of antioxidants, thermal stabilizers, gamma ray or ultraviolet stabilizers, flame retardants, antistatic agents, TiO_2 , talc, pigments or dyes, hydrophilic surfactants, hydrophobic agents, antiblocking agents, and electrically-conductive fillers.

The continuous thermoplastic constituent may be selected from a group consisting of polyolefins, polyamides, and polyesters and wherein the noncontinuous phase or phases have Polymer Melting Temperatures in the range of 30°C through 50°C below the PMTs of said continuous phase,

wherein said polyolefin may be isotactic polypropylene, propylene-ethylene random copolymer, propylene-ethylene block copolymer, poly (4-methyl-1-pentene), polystyrene, or linear low density polyethylene, wherein said polyamide is nylon-6, nylon-66, nylon-11, or nylon-12, and wherein said polyester is polyethyleneterephthalate, polybutyleneterephthalate, or polytetramethyleneterephthalate.

The fabric may essentially consist of fibers composed of a continuous polypropylene phase in which is dispersed two discontinuous phases, one composed of linear low density polyethylene and the other of ethylene/acrylic acid copolymer.

Said continuous thermoplastic constituent preferably is an isotactic polypropylene having melt flow rate of 4 to 100g/min.

The other fibers may be selected from the group of consisting of cotton fibers, viscose rayon fibers, acrylic fibers, wool fibers, polypropylene fibers, polyethylene fibers, polyester fibers, polyamide fibers, polyaramid fibers, carbon fibers, chitin fibers, sheath-core bicomponent fibers, side-by-side bicomponent fibers, other bi- and multicomponent fibers, and the mixture thereof.

The invention is further concerned with the use of said fabrics, particularly those laminated to a polyolefin film or a linear low density polyethylene film, to form a structure suitable as a liquid-impermeable protective barrier, which structure is particularly suitable for use as a diaper backsheet, and

with the use of said fabric laminated to a microfibrinous layer to form a structure suitable for use as a breathable liquid-impermeable protective barrier, wherein said microfibrinous layer is a polyolefin meltblown or a wetlaid polyolefin synthetic pulp.

Claims

1. A thermally-bonded nonwoven fabric having a basis weight in the range of 5 g/m² through 100 g/m² made from a web that comprises from 100 to 5 percent by weight of one or more multiconstituent fibers having a fineness of 5 to 50 μm (microns) and from 0 to 95 percent by weight of other fibers

characterized in that,

said multiconstituent fibers are composed of highly dispersed blends of at least two different immiscible thermoplastic polymers which are present as a dominant continuous polymer phase and at least one discontinuous phase dispersed therein, wherein the polymer of said discontinuous phase or phases has a Polymer Melting Temperature (PMT) at least 30°C below the PMT of said continuous phase, wherein the mean of the cross-sectional areas of said discontinuous phase or phases is less than 0.1% of the cross-sectional area of said multiconstituent fibers, and wherein said multiconstituent fibers are configured such that said noncontinuous phase or phases occupy a substantial portion of the fiber surfaces.

2. A fabric according to claim 1 that consists essentially of from 50 to 5% by weight of said multiconstituent fibers and from 50 to 95% by weight of other textile fibers.

3. A fabric according to claim 1 that consists essentially of 100% of said multiconstituent fibers.
4. A fabric according to claim 1 in which said multiconstituent fibers have a fineness of 1-10 g/9000 m (1-10 denier) and a surface to volume ratio greater than 0.6.
5. A fabric according to any of the preceding claims wherein the continuous thermoplastic constituent is selected from a group consisting of polyolefins, polyamides, and polyesters and wherein the discontinuous phase or phases have Polymer Melting Temperatures in the range of 30°C through 50°C below the PMTs of said continuous phase.
6. A fabric according to claim 5, wherein said polyolefin is isotactic polypropylene, propylene-ethylene random copolymer, propylene-ethylene block copolymer, poly (4-methyl-1-pentene), polystyrene, or linear low density polyethylene, wherein said polyamide is nylon-6, nylon-66, nylon-11, or nylon-12, and wherein said polyester is polyethyleneterephthalate, polybutyleneterephthalate, or polytetramethyleneterephthalate.
7. A fabric according to any of the preceding claims wherein the continuous thermoplastic constituent is an isotactic polypropylene having a melt flow rate of 4 to 100 g/min.
8. A fabric according to claim 5 that essentially consists of fibers composed of a continuous polypropylene phase in which is dispersed two discontinuous phases, one composed of linear low density polyethylene and the other of ethylene/acrylic acid copolymer.
9. A fabric according to claim 5, wherein the continuous polymer phase consists essentially of a polypropylene phase in which is dispersed a discontinuous phase composed of polyethylene.
10. A fabric according to any of the preceding claims wherein said other fibers are selected from the group consisting of cotton fibers, viscose rayon fibers, acrylic fibers, wool fibers, polypropylene fibers, polyethylene fibers, polyester fibers, polyamide fibers, polyaramid fibers, carbon fibers, chitin fibers, sheath-core bicomponent fibers, side-by-side bicomponent fibers, other bi- and multicomponent fibers, and the mixtures thereof.
11. A laminate made by combining nonwoven fabric according to any of claims 1 to 10 with films, paper, tissue, woven or nonwoven fabrics.
12. A laminate according to claim 11 of sandwich structure comprising in sequence a first layer of nonwoven fabric, a second layer of a polyolefin film, and a third layer of nonwoven fabric, wherein the layers are bonded to each other and wherein each of the first and third layers comprises nonwoven fabric of any one of claims 1 to 10.
13. A laminate according to claim 12 comprising a microfibrinous inner layer formed of polyethylene, particularly of linear low density polyethylene, sandwiched between outer layers formed of said nonwoven fabric.
14. A laminate according to claim 12 comprising a microfibrinous inner layer formed of polypropylene, particularly of meltblown polypropylene, sandwiched between outer layers formed of said nonwoven fabric.
15. A laminate according to any of the claims 11 to 14, in that said outer layers are of nonwoven fabric made of spunbonded fibrous webs.
16. Use of a laminate according to any of the claims 11 to 15 as a structure suitable as a liquid-impermeable protective barrier.
17. Use according to claim 16 as a structure that is suitable as a diaper backsheet.
18. Use of a laminate according to any of claims 11 to 15 laminated to a microfibrinous layer as a structure suitable for use as a breathable liquid-impermeable protective barrier.
19. Use according to claim 18 wherein said microfibrinous layer is a polyolefin meltblown or a wetlaid polyolefin synthetic pulp.

Patentansprüche

1. Thermisch verklebtes Faservlies, das ein Grundgewicht im Bereich von 5 g/m² bis 100 g/m² hat, hergestellt aus einer Bahn, die 100 bis 5 Gew.-% eine oder mehrere Multikonstituentenfasern mit einer Feinheit von 5 bis 50 µm (Mikrometer) und 0 bis 95 Gew.-% andere Fasern aufweist,
dadurch gekennzeichnet, daß
die Multikonstituentenfasern aus feinstverteilten Gemischen aus wenigstens zwei verschiedenen, nichtmischbaren thermoplastischen Polymeren, die als eine vorherrschende kontinuierliche Polymerphase anwesend sind, und wenigstens einer darin verteilten diskontinuierlichen Phase bestehen, wobei das Polymer der diskontinuierlichen Phase oder Phasen eine Polymerschmelztemperatur (PMT) hat, die wenigstens 30 °C unter der Polymerschmelztemperatur der kontinuierlichen Phase liegt, wobei das Mittel der Querschnittsflächen der diskontinuierlichen Phase oder Phasen weniger als 0,1 % der Querschnittsfläche der Multikonstituentenfasern ist, und wobei die Multikonstituentenfasern so ausgebildet sind, daß die nichtkontinuierliche Phase oder diese Phasen einen wesentlichen Bereich der Faseroberflächen einnehmen.
2. Faservlies nach Anspruch 1, das im wesentlichen aus 50 bis 5 Gew.-% der Multikonstituentenfasern und 50 bis 95 Gew.-% anderen Textilfasern besteht.
3. Faservlies nach Anspruch 1, das im wesentlichen aus 100 % der Multikonstituentenfasern besteht.
4. Faservlies nach Anspruch 1, wobei die Multikonstituentenfasern eine Feinheit von 1-10 g/9000 m (1-10 den) und ein Verhältnis von Oberfläche zu Volumen von größer als 0,6 haben.
5. Faservlies nach einem der vorhergehenden Ansprüche, wobei der kontinuierliche thermoplastische Bestandteil aus einer Gruppe ausgewählt ist, die aus Polyolefinen, Polyamiden und Polyestern besteht, und wobei die diskontinuierliche Phase oder Phasen Polymerschmelztemperaturen im Bereich von 30 °C bis 50 °C unter den Polymerschmelztemperaturen der kontinuierlichen Phase haben.
6. Faservlies nach Anspruch 5, wobei das Polyolefin isotaktisches Polypropylen, statistisches Propylen-Ethylen-Copolymer, Propylen-Ethylen-Blockcopolymer, Poly(4-methyl-1-penten), Polystyrol oder lineares Polyethylen niedriger Dichte ist, wobei das Polyamid Nylon-6, Nylon-66, Nylon 11 oder Nylon-12 ist, und wobei der Polyester Polyethylenterephthalat, Polybutylenterephthalat oder Polytetramethylenterephthalat ist.
7. Faservlies nach einem der vorhergehenden Ansprüche, wobei der kontinuierliche thermoplastische Bestandteil ein isotaktisches Polypropylen ist, das eine Fließfähigkeit von 4 bis 100 g/min hat.
8. Faservlies nach Anspruch 5, das im wesentlichen aus Fasern besteht, die aus einer kontinuierlichen Polypropylenphase bestehen, in der zwei diskontinuierliche Phasen dispergiert sind, von denen die eine aus linearem Polyethylen niedriger Dichte und die andere aus Ethylen-Acrylsäure-Copolymer besteht.
9. Faservlies nach Anspruch 5, wobei die kontinuierliche Polymerphase im wesentlichen aus einer Polypropylenphase besteht, in der eine aus Polyethylen bestehende diskontinuierliche Phase dispergiert ist.
10. Faservlies nach einem der vorhergehenden Ansprüche, wobei die anderen Fasern aus der Gruppe ausgewählt sind, die aus Baumwollfasern, Viskoserayonfasern, Acrylfasern, Wollfasern, Polypropylenfasern, Polyethylenfasern, Polyesterfasern, Polyamidfasern, Polyaramidfasern, Kohlenstofffasern, Chitinfasern, Mantel-Kern-Bikomponentenfasern, Seite-an-Seite-Bikomponentenfasern, anderen Bi- und Multikomponentenfasern und den Gemischen davon besteht.
11. Laminat, das hergestellt ist durch Vereinigen von Faservlies nach einem der Ansprüche 1 bis 10 mit Folien, Papier, feinem Gewebe, gewebten oder ungewebten textilen Flächengebilden.
12. Laminat nach Anspruch 11 mit Verbundstruktur, das aufeinanderfolgend aufweist: eine erste Schicht aus Faservlies, eine zweite Schicht aus einer Polyolefinfolie und eine dritte Schicht aus ungewebtem textilen Flächengebilde, wobei die Schichten miteinander verbunden sind und wobei die erste und die dritte Schicht jeweils Faservlies nach einem der Ansprüche 1 bis 10 aufweisen.
13. Laminat nach Anspruch 12, das aufweist: eine innere Mikrofaserschicht, die aus Polyethylen, insbesondere aus

linearem Polyethylen niedriger Dichte, gebildet ist und die zwischen äußeren Schichten, die aus dem Faservlies gebildet sind, liegt.

14. Laminat nach Anspruch 12, das aufweist: eine innere Mikrofaserschicht, die aus Polypropylen, insbesondere schmelzgeblasenem Polypropylen, gebildet ist und die zwischen äußeren Schichten, die aus dem Faservlies gebildet sind, liegt.

15. Laminat nach einem der Ansprüche 11 bis 14, wobei die äußeren Schichten aus Faservlies sind, das aus Spinnvliesbahnen hergestellt ist.

16. Verwendung eines Laminats nach einem der Ansprüche 11 bis 15 als eine Struktur, die als eine flüssigkeitsundurchlässige Schutzschicht geeignet ist.

17. Verwendung nach Anspruch 16 als eine Struktur, die als eine Windelrückenfolie geeignet ist.

18. Verwendung eines Laminats nach einem der Ansprüche 11 bis 15, das auf eine Mikrofaserschicht als eine Struktur laminiert ist, die zur Verwendung als eine atmungsfähige, flüssigkeits-undurchlässige Schutzschicht geeignet ist.

19. Verwendung nach Anspruch 18, wobei die Mikrofaserschicht ein schmelzgeblasenes Polyolefin oder eine naßgelegte synthetische Polyolefin-Pulpe ist.

Revendications

1. Etoffe non tissée liée à chaud, ayant un poids au mètre carré de 5 g/m² à 100 g/m², produite à partir d'une bande qui comprend 100 à 5 % en poids d'une plusieurs fibres à constituants multiples ayant une finesse de 5 à 50 µm (micromètres) et 0 à 95 % en poids d'autres fibres, caractérisée en ce que lesdites fibres à constituants multiples sont formées de mélanges hautement dispersés d'au moins deux polymères thermoplastiques non miscibles différents qui sont présents sous forme d'une phase polymérique continue dominante et d'au moins une phase discontinue dispersée dans cette phase polymérique, le polymère de ladite ou lesdites phases discontinues ayant une température de fusion de polymère (TFP) inférieure d'au moins 30°C à la TFP de ladite phase continue, la moyenne des surfaces en section transversale de ladite ou lesdites phases discontinues étant inférieure à 0,1 % de la surface en section transversale desdites fibres à constituants multiples, et lesdites fibres à constituants multiples ayant une configuration telle que ladite ou lesdites phases non continues occupent une portion importante de la surface des fibres.

2. Etoffe suivant la revendication 1, qui consiste essentiellement en 50 à 5 % en poids des fibres à constituants multiples et 50 à 95 % en poids d'autres fibres textiles.

3. Etoffe suivant la revendication 1, qui consiste essentiellement en 100 % des fibres à constituants multiples.

4. Etoffe suivant la revendication 1, dans laquelle les fibres à constituants multiples ont une finesse de 1-10 g/9000 m (1-10 deniers) et un rapport de la surface au volume supérieur à 0,6.

5. Etoffe suivant l'une quelconque des revendications précédentes, dans laquelle le constituant thermoplastique continu est choisi dans le groupe consistant en polyoléfines, polyamides et polyesters, et dans laquelle la ou les phases discontinues ont des températures de fusion de polymère inférieures de 30°C à 50°C aux TFP de la phase continue.

6. Etoffe suivant la revendication 5, dans laquelle la polyoléfine consiste en un polypropylène isotactique, un copolymère statistique propylène-éthylène, un copolymère séquencé propylène-éthylène, un poly-(4-méthyl-1-pentène), un polystyrène ou un polyéthylène linéaire basse densité, le polyamide est le Nylon-6, le Nylon-66, le Nylon-11 ou le Nylon-12, et le polyester est un polymère de téréphthalate d'éthylène, un polymère de téréphthalate de butylène ou un polymère de téréphthalate de tétraméthylène.

7. Etoffe suivant l'une quelconque des revendications précédentes, dans laquelle le constituant thermoplastique continu est un polypropylène isotactique ayant une vitesse d'écoulement en masse fondue de 4 à 100 g/min.

8. Etoffe suivant la revendication 5, qui consiste essentiellement en fibres constituées d'une phase de polypropylène

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continue dans laquelle sont dispersées deux phases discontinues, l'une constituée d'un polyéthylène linéaire basse densité et l'autre constituée d'un copolymère éthylène/acide acrylique.

- 5 9. Etoffe suivant la revendication 5, dans laquelle la phase polymérique continue consiste essentiellement en une phase de polypropylène dans laquelle est dispersée une phase discontinue constituée de polyéthylène.
- 10 10. Etoffe suivant l'une quelconque des revendications précédentes, dans laquelle les autres fibres sont choisies dans le groupe consistant en fibres de coton, fibres de viscose du type rayonne, fibres acryliques, fibres de laine, fibres de polypropylène, fibres de polyéthylène, fibres de polyester, fibres de polyamides, fibres de polyaramides, fibres de carbone, fibres de chitine, fibres à deux composants gaine-noyau, fibres à deux composants à juxtaposition, d'autres fibres à deux constituants et à constituants multiples, et leurs mélanges.
- 15 11. Stratifié produit en associant une étoffe non tissée suivant l'une quelconque des revendications 1 à 10 à des films, un papier, un tissu, des étoffes tissées ou des étoffes non tissées.
- 20 12. Stratifié suivant la revendication 11 à structure en sandwich, comprenant successivement une première couche d'une étoffe non tissée, une deuxième couche d'un film de polyoléfine et une troisième couche d'une étoffe non tissée, dans lequel les couches sont liées les unes aux autres et chacune des première et troisième couches comprend une étoffe non tissée suivant l'une quelconque des revendications 1 à 10.
- 25 13. Stratifié suivant la revendication 12, comprenant une couche intérieure microfibreuse formée de polyéthylène, en particulier d'un polyéthylène linéaire basse densité, en sandwich entre des couches extérieures formées de l'étoffe non tissée.
- 30 14. Stratifié suivant la revendication 12, comprenant une couche intérieure microfibreuse formée de polypropylène, en particulier d'un polypropylène produit par soufflage de masse fondue, en sandwich entre des couches extérieures formées de l'étoffe non tissée.
- 35 15. Stratifié suivant l'une quelconque des revendications 11 à 14, dans lequel les couches extérieures sont constituées d'une étoffe non tissée produite à partir de bandes de fibres liées par filage.
16. Utilisation d'un stratifié suivant l'une quelconque des revendications 11 à 15 en tant que structure convenable comme barrière de protection imperméable aux liquides.
- 40 17. Utilisation suivant la revendication 16 en tant que structure convenable comme une feuille de support de couche.
18. Utilisation d'un stratifié suivant l'une quelconque des revendications 11 à 15, stratifié à une couche microfibreuse servant de structure convenable comme barrière de protection imperméable aux liquides et perméable aux gaz.
- 45 19. Utilisation suivant la revendication 18, dans laquelle la couche microfibreuse est une couche de polyoléfine produite par soufflage de masse fondue ou une pâte synthétique de polyoléfine couchée en phase humide.
- 50
- 55

Fig. 1

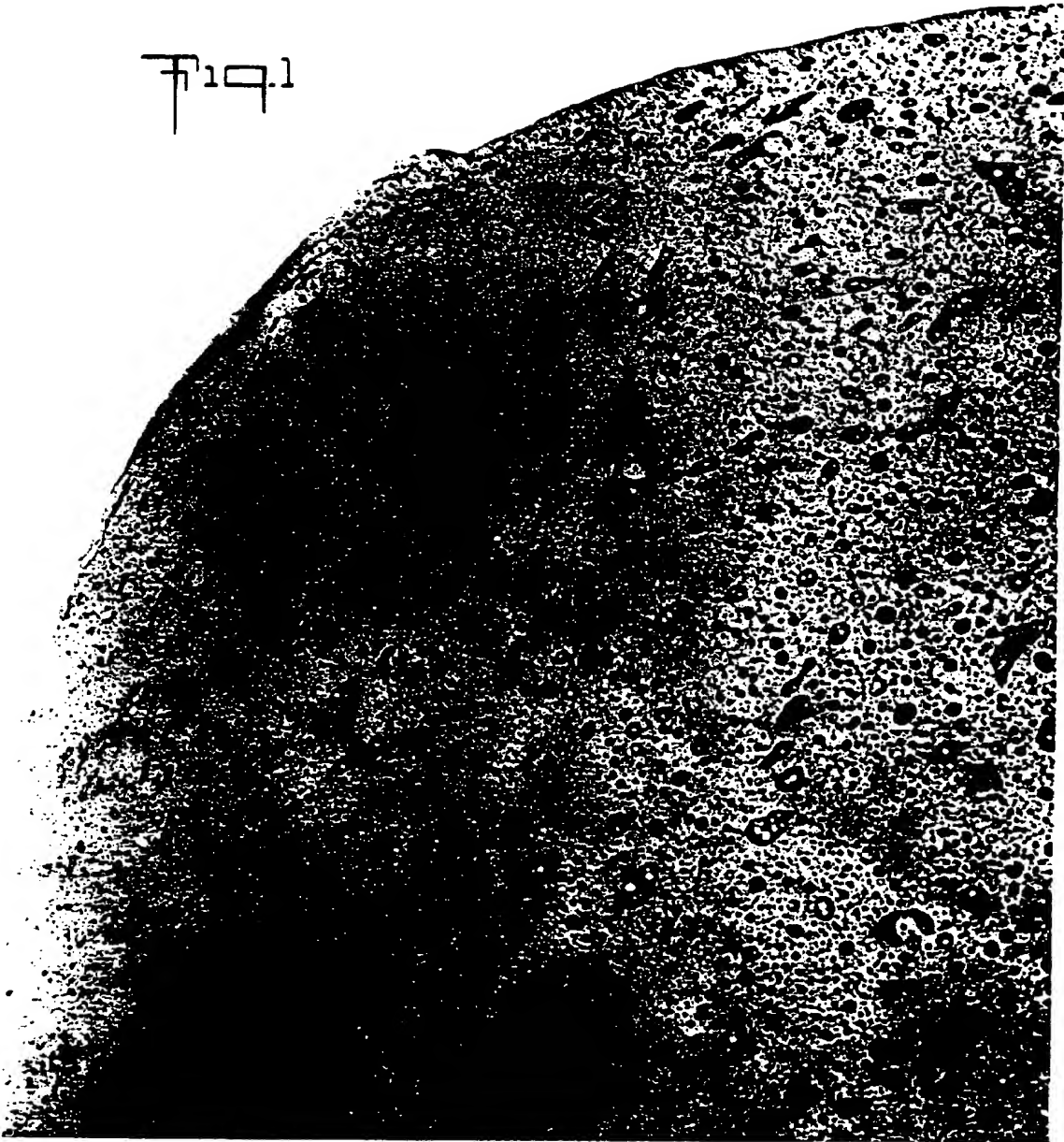


Fig. 2

